Trunked Radio System Basics

Communications Academy 2011

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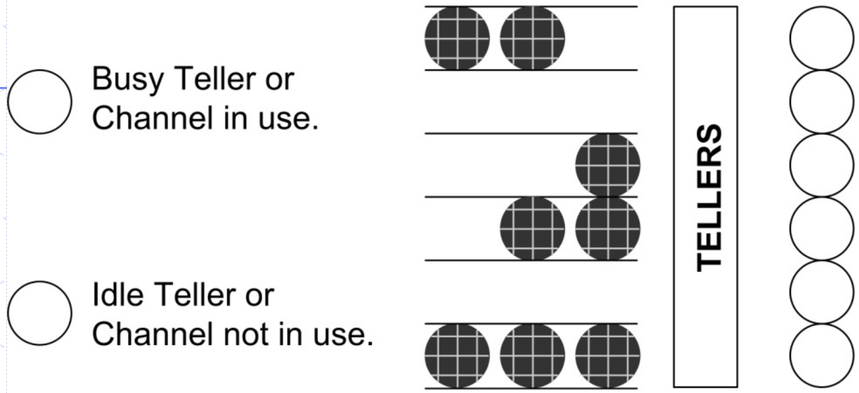
Trunking Concepts

Trunking Technology is Not New

- Originally developed in the late 1800s and early 1900s
- Basis for the telephone network (circuit switched not IP based)
- Early mobile telephone systems such as IMTS use trunking
- Cellular systems use trunking
- Most concepts are the same

Conventional Radio System

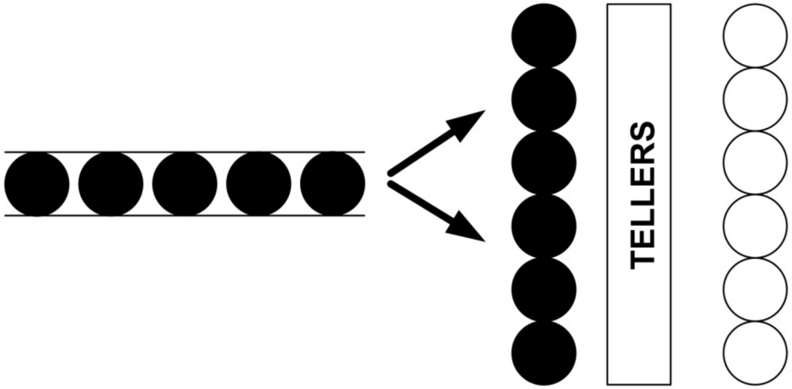


Busy Teller or
Channel in use.

Idle Teller or
Channel not in use.

Conventional systems allow channel resources to be vacant even when there is demand for service.

Trunked Radio System



Trunked systems distribute the users between all of the channels automatically. This provides much better utilization of the channel resources.

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Trunking Concepts

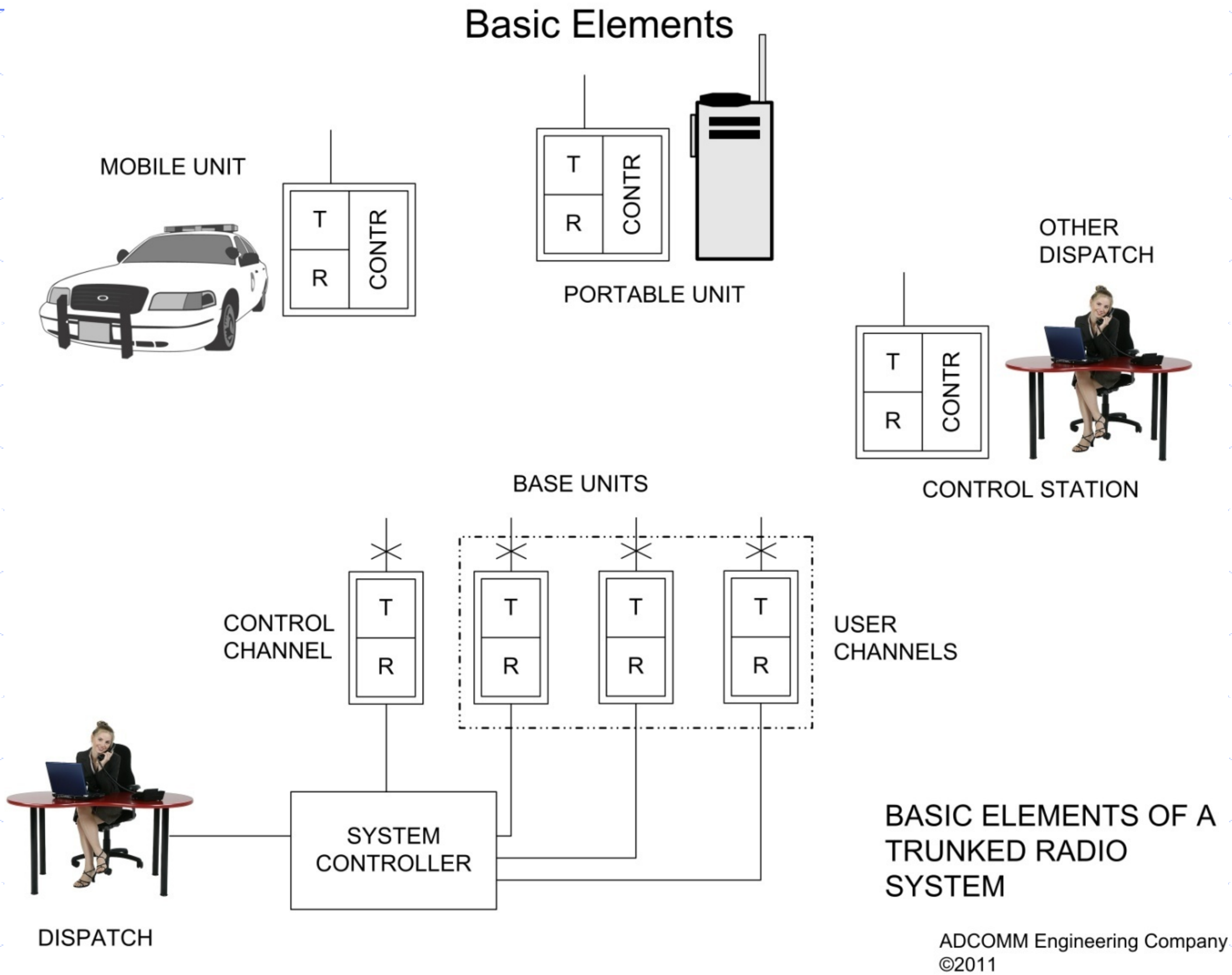
- Instead of frequencies the term “talkgroups” is used
- The actual assignment of a frequency is not under the control of the radio user
- The control computer assigns a talkgroup to a particular frequency for communicating
- User radios typically have between 48 and 512 talkgroups depending on the brand and model
- When a talkgroup is not being used it does not use system resources

Trunking Concepts

Talkgroups

- Radio consoles can merge talkgroups together
- Radio units can be re-grouped by the system into a special talkgroup on a per radio basis
- The large number of talkgroups available (most systems support 2000 or more) allows talkgroups to be created for special coordination functions
- Talkgroups can be scanned similar to scan on conventional mobiles and portables
- Private call talkgroups allow two units to communicate without anyone else listening to that talkgroup

Trunking Concepts



BASIC ELEMENTS OF A TRUNKED RADIO SYSTEM

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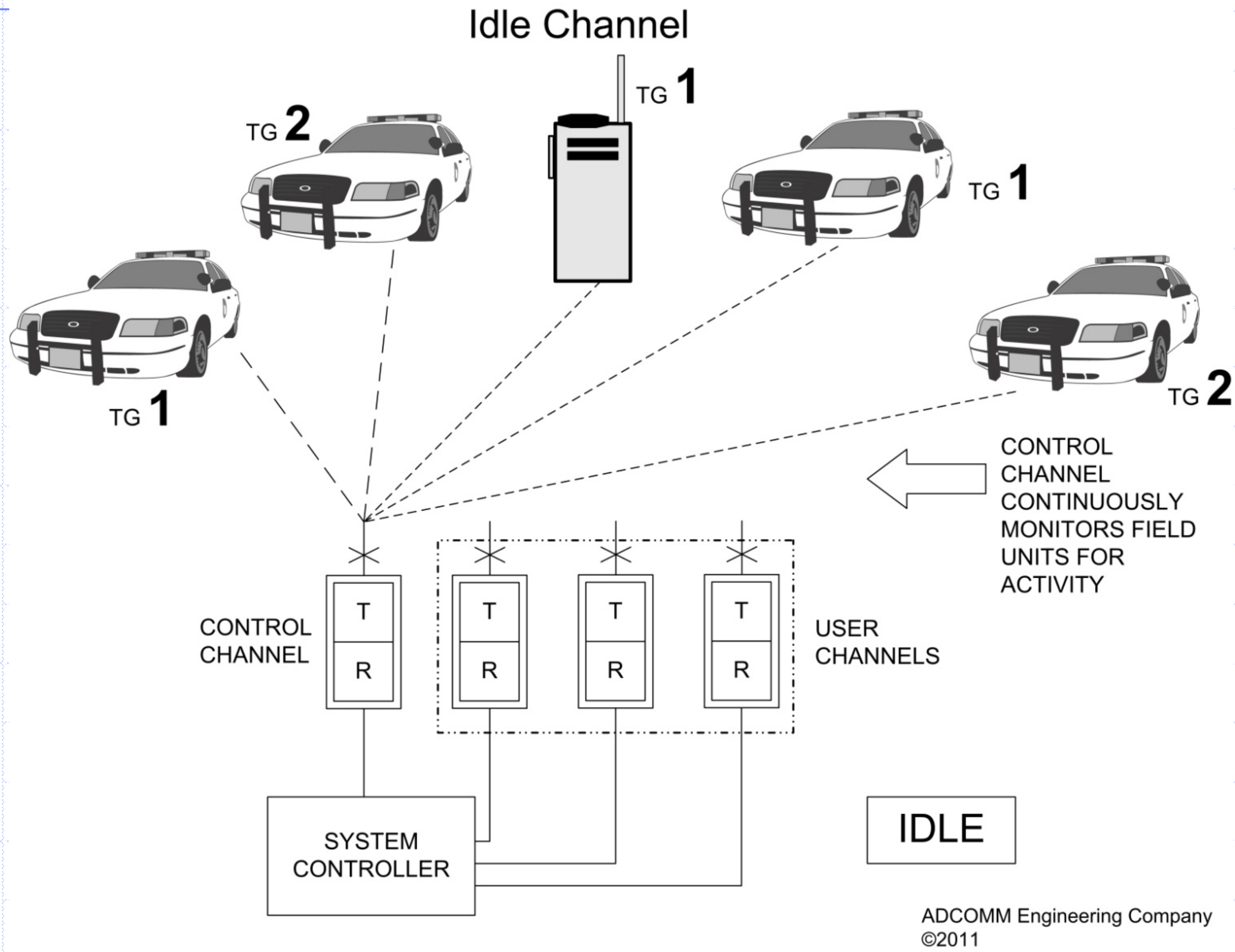
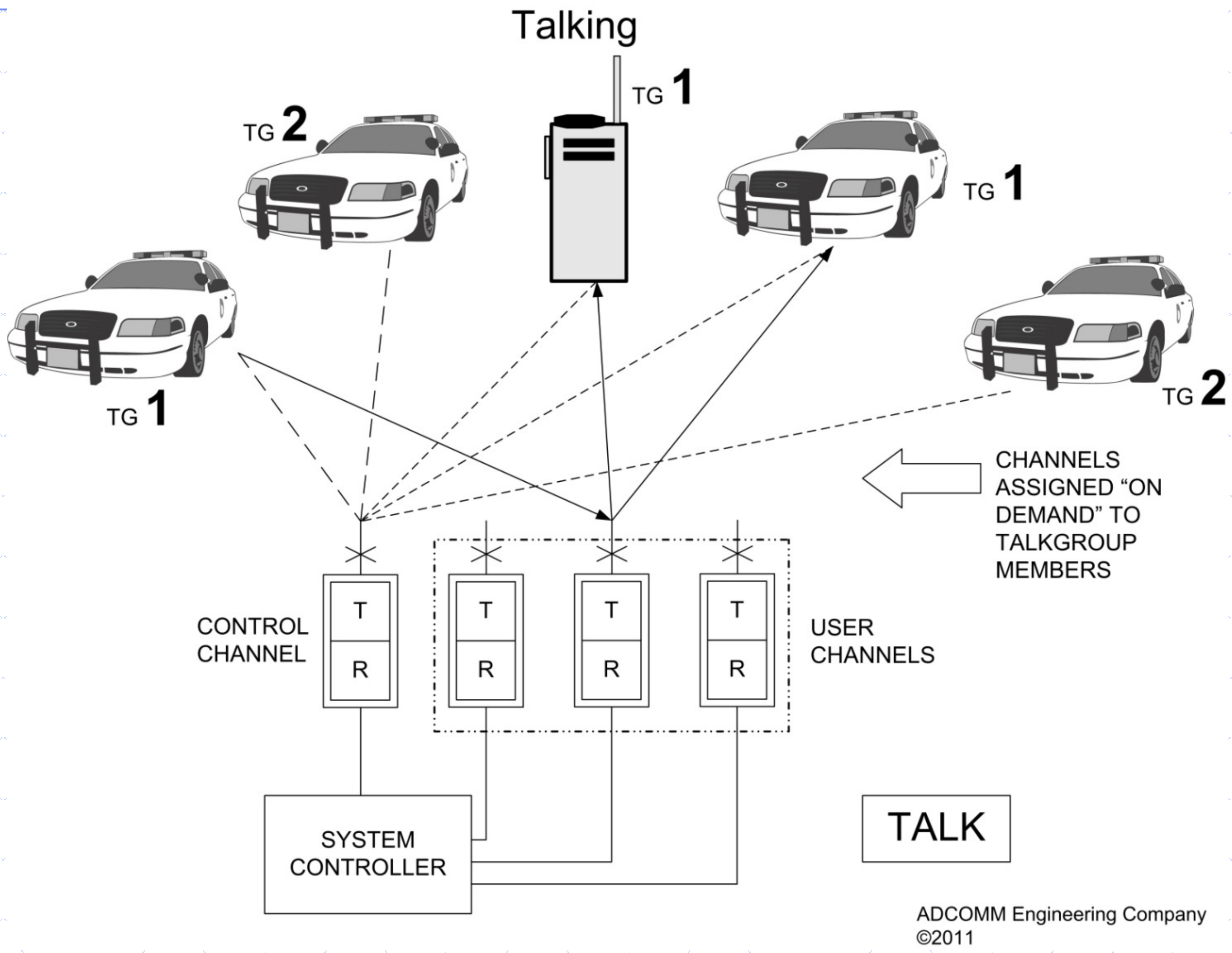
Trunking Concepts



Trunking Concepts



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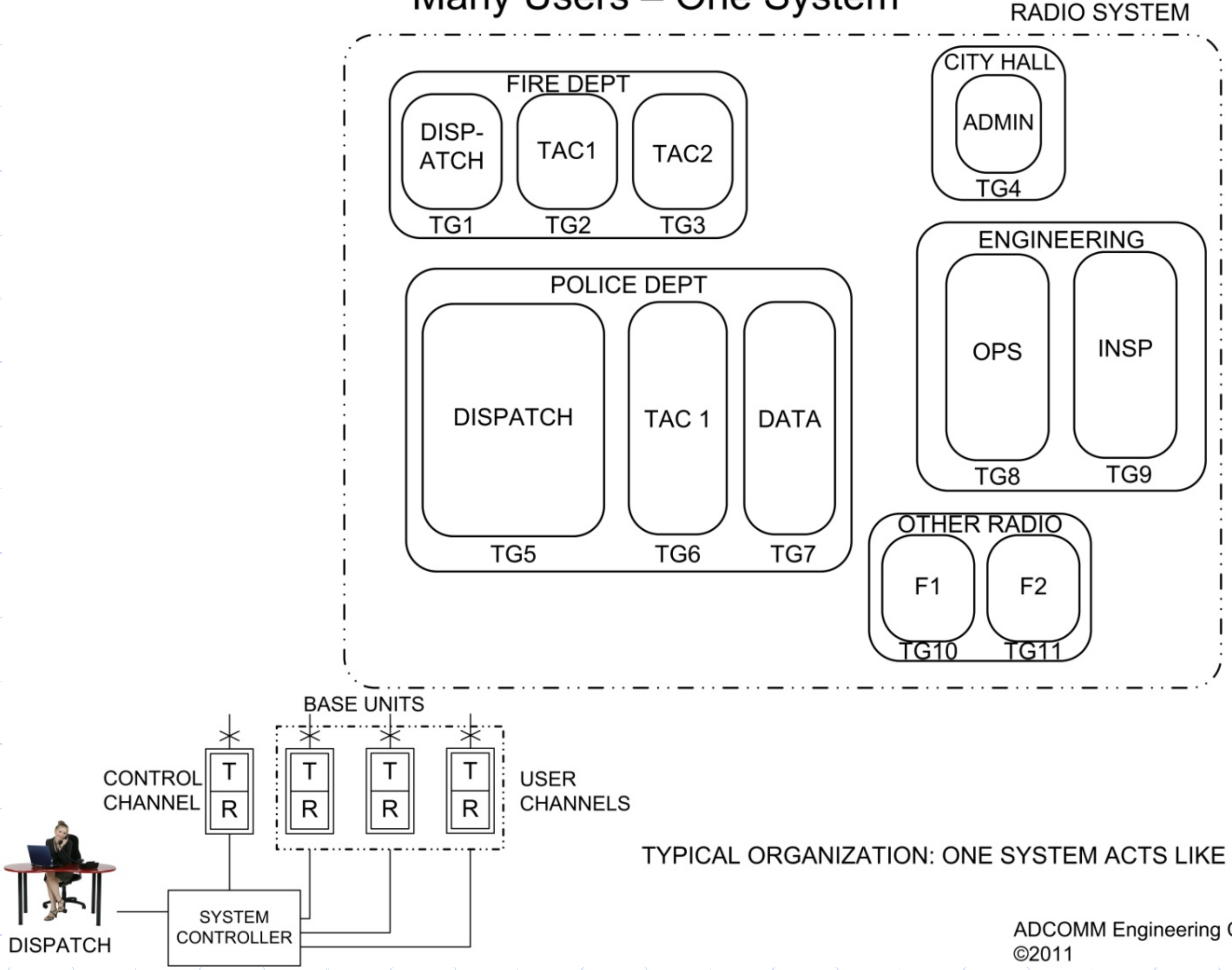
Talkgroups

Many Users – One System



TYPICAL ORGANIZATION: ONE SYSTEM ACTS LIKE MANY

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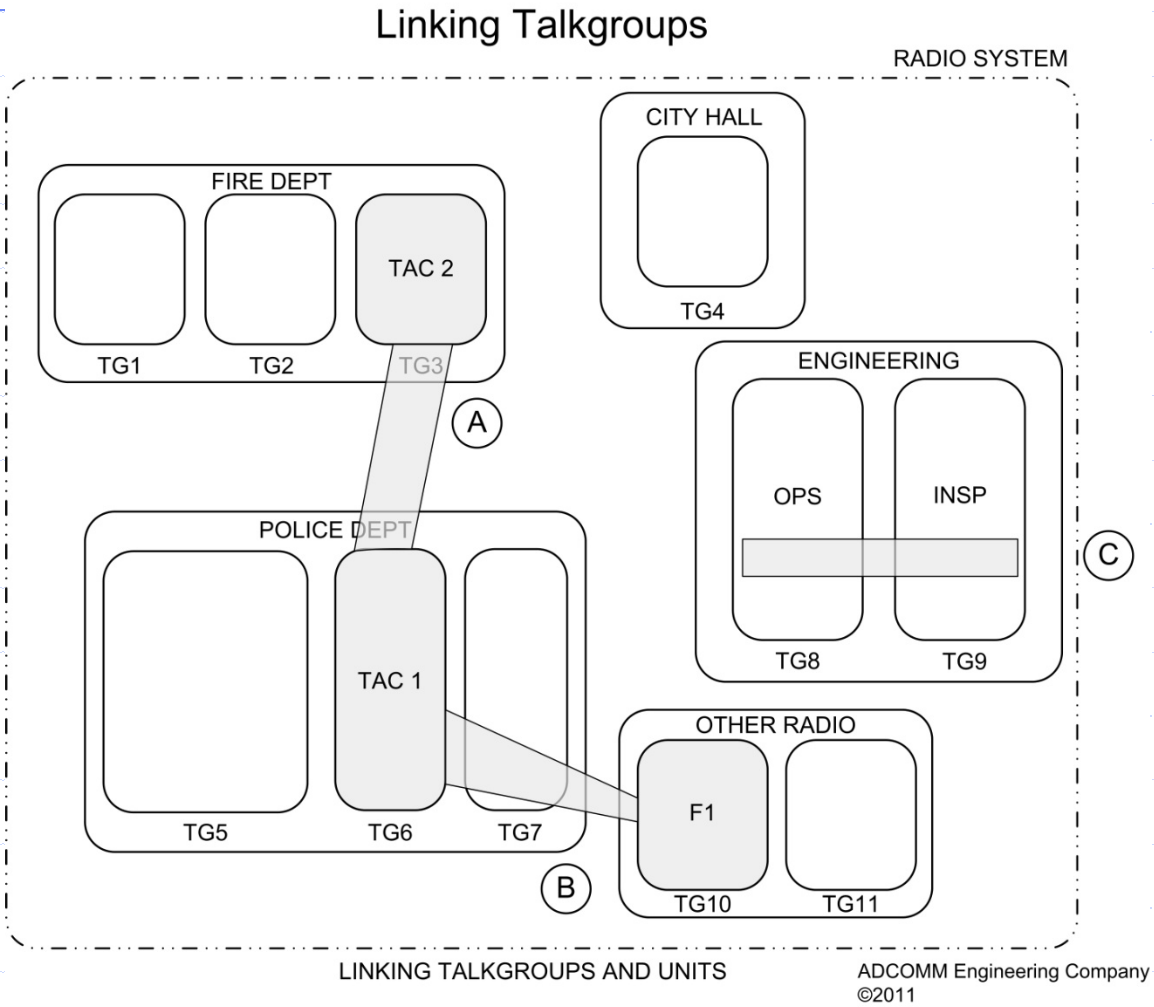
Talkgroups


Linking Talkgroups
RADIO SYSTEM
CITY HALL
TG4
FIRE DEPT
TAC 2
TG1
TG2
TG3
A
ENGINEERING
OPS
INSP
TG8
TG9
C
POLICE DEPT
TAC 1
TG5
TG6
TG7
OTHER RADIO
F1
TG10
TG11
B
LINKING TALKGROUPS AND UNITS
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Basic Features

- Talkgroup call
- PTT ID
- Emergency alerting
- Multiple priorities
- Busy queue/call back

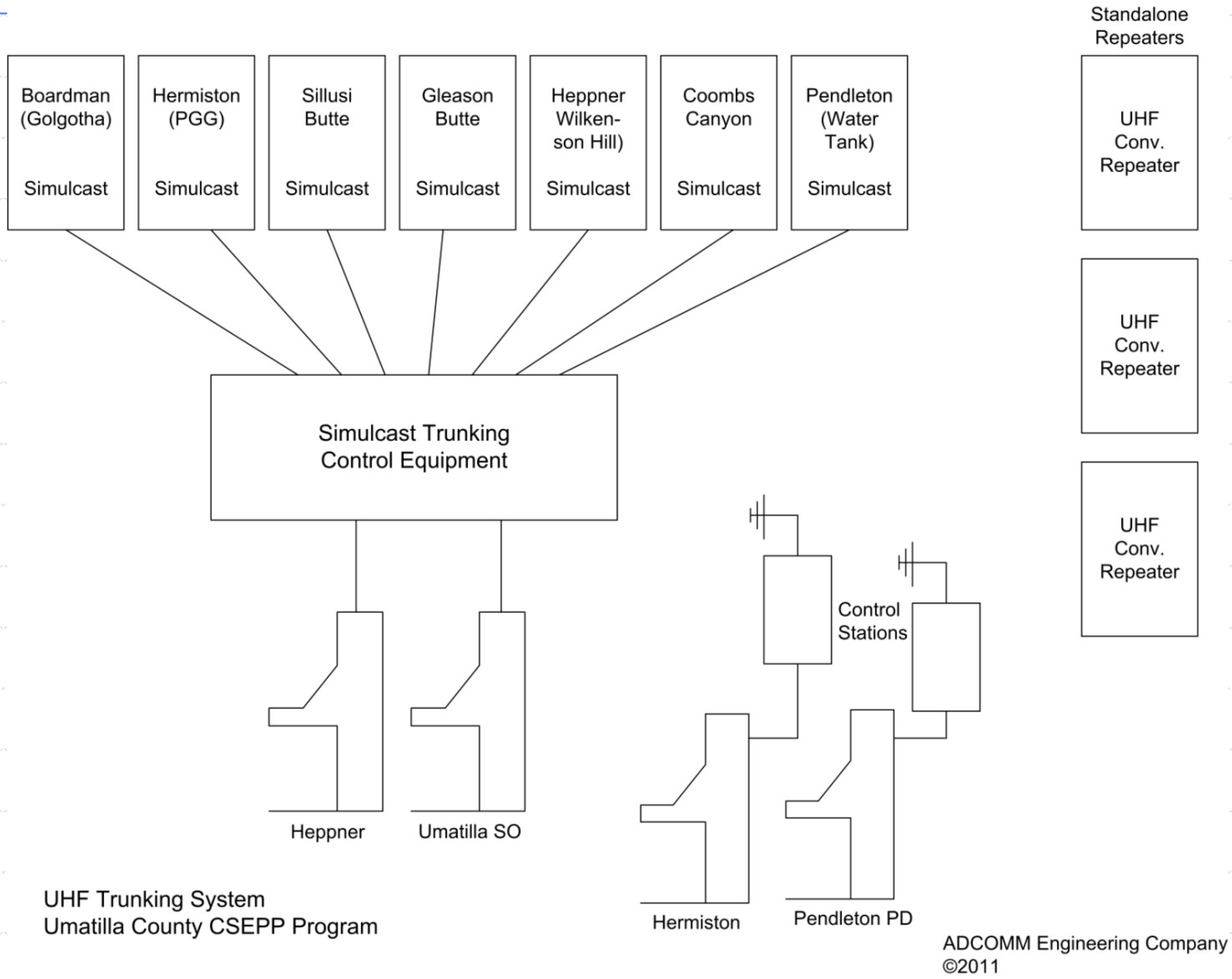
Basic Features

- Private call
- Talkgroup merge
- Scan
- Radio activity logging
- Call alert

Dispatch Configuration

- Directly connected consoles
  - Advanced features
  - Dispatch audio override
- Control station connected consoles
  - Work like a mobile unit
  - Limited features

Basic System Design



UHF Trunking System
Umatilla County CSEPP Program

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Talkgroups for Daily Operation

- Mutual aid
  - Law enforcement
  - Fire
  - EMS
  - Government
  - Other?

Talkgroups for Daily Operation

- Connection to conventional
  - VHF
    - Fire tone out?
    - Law
    - Fire mutual aid
    - Others?
    - Permanent or temporary?
  - UHF
    - DMRS?
    - Standalone repeaters?

Basic Trunking Technologies

MPT 1327

- Development
  - British Ministry of Post and Telecommunications (MPT) defined the MPT 1327 protocol as an open protocol
  - Analog technology
  - Dedicated control channel: 1200 bps
  - Single and multi-site capable
  - 24 channel / 23 talk path limit per site
- Vendors
  - Non-proprietary technology
  - Numerous radio vendors: Conoid, Motorola, Nokia, Simcoe, Tait, and others

Basic Trunking Technologies

New Proprietary

- Based on either Motorola (MotoTRBO) or Kenwood NXDN
  - Advanced features such as PTT-ID, Name Alias, GPS, etc.
  - MotoTRBO is TDMA with two timeslots in a 12.5 kHz channel
  - NXDN is FDMA with a single 6.25 kHz voice channel
  - MotoTRBO based on European DMR standard
  - NXDN is proprietary
  - 16 channel / talk path limit per site
- Vendors
  - Proprietary technology
  - Numerous radio vendors: Motorola, Nokia, Simcoe, Tait, and others

Basic Trunking Technologies

Smartnet™

- Development
  - Motorola
  - Analog technology
  - Dedicated control channel: 3600 bps
  - Single and multi-site simulcast capable
  - 28 channel / 27 talk path limit per site
- Vendors
  - Proprietary technology
  - Motorola
  - EF Johnson (mobiles/portables)

Basic Trunking Technologies

SmartZone®

- Development
    - Motorola
    - Analog and digital technology
    - Analog dedicated control channel: 3600 bps
    - Digital dedicated control channel: 9600 bps
    - Single and multi-site simulcast capable
    - 28 channel / 27 talk path limit per site
- Vendors
    - Proprietary technology
    - Motorola
    - EF Johnson (mobiles/portables)

Basic Trunking Technologies

SmartZone®

- Development
  - Motorola
  - Analog and digital technology
  - Analog dedicated control channel: 3600 bps
  - Digital dedicated control channel: 9600 bps
  - Single and multi-site simulcast capable
  - 28 channel / 27 talk path limit per site
- Vendors
  - Proprietary technology
  - Motorola
  - EF Johnson (mobiles/portables)

Basic Trunking Technologies

SmartZone OmniLink®

- Development
  - Motorola
  - Analog and digital technology
  - Analog dedicated control channel: 3600 bps
  - Digital dedicated control channel: 9600 bps
  - Single, multi-site simulcast and multi-SmartZone capable
  - 28 channel / 27 talk path limit per site
- Vendors
  - Proprietary technology
  - Motorola
  - EF Johnson (mobiles/portables)

Basic Trunking Technologies

LTR®

- Development
  - Logic Trunked Radio (LTR®)
  - EF Johnson
  - Analog technology
  - Analog home channel concept: 300 bps subaudible data
  - Single and multi-site capable
  - 20 channels per site
- Vendors
  - Proprietary technology
  - Numerous radio vendors: EF Johnson, Uniden, King, Standard, Repco, and others. IDA Corporation offers LTR® conversion products for other vendor radios.

Basic Trunking Technologies

LTR-Net®

- Development
  - Logic Trunked Radio Net (LTR-Net®)
  - EF Johnson
  - Analog technology
  - Analog home channel concept: 300 bps subaudible data
  - Single and multi-site capable
  - Advanced features over LTR®
  - 20 channels per site
- Vendors
  - Proprietary technology
  - Numerous radio vendors: EF Johnson and IDA Corporation offers LTR® conversion products for other vendor radios

Basic Trunking Technologies

Multi-Net®

- Development
  - EF Johnson
  - Analog technology
  - Analog home channel concept: 300 bps subaudible data
  - Single and multi-site capable
  - Advanced features over LTR-Net®
  - 20 channels per site
- Vendors
  - Proprietary technology
  - Numerous radio vendors: EF Johnson, Uniden, King, Standard, Repco, and others

Basic Trunking Technologies

EDACS®

- Development
  - Enhanced Digital Access Communications System (EDACS®)
  - M/A-COM
  - Analog and digital technology
  - Dedicated control channel: 9600 bps
  - Single and multi-site simulcast capable
  - 23 channel / 22 talk path limit per site
- Vendors
  - Proprietary technology
  - M/A-COM

Basic Trunking Technologies

OpenSky®

- Development
  - M/A-COM
  - Digital technology (4-slot TDMA[1])
  - Dedicated control channel: 19,200 bps
  - Single and multi-site capable
  - 6 channel / 24 talk path limit per site
- Vendors
  - Proprietary technology
  - M/A-COM

[1] TDMA = Time Division Multiple Access

Basic Trunking Technologies

iDEN®

- Development
  - Motorola
  - Digital technology (6-slot TDMA)
  - Dedicated control channel: 9600 bps
  - Multi-site capable
  - 20 channel (omni) / 120 PTT path limit per omni site
- Vendors
  - Proprietary technology
  - Motorola

Basic Trunking Technologies

TETRA®

- Development
  - European Telecommunications Standards Institute
  - Digital Technology (4-slot TDMA)
  - Dedicated control channel: 18,000 bps
  - Multi-site capable
  - 8 channel (omni) / 32 talk path limit per omni site
  - 24 channel (3 sector) / 96 talk path limit per 3 sector site
- Vendors
  - Non-proprietary technology
  - 23 companies making core products

Basic Trunking Technologies

- Project 25
  - Digital voice channel – AMBE Vocoder
  - Standards based for basic features
  - Current systems are FDMA
    - 9600 bps channel rate
    - One voice channel per RF channel
    - 7.2 kbps vocoder
    - Advanced features
    - Both trunking and conventional systems

Basic Trunking Technologies

- Project 25
  - Phase 2 TDMA being developed systems in 2012
  - 12,000 bps control channel
  - Two voice channels per RF channel (2-timeslots)
  - 3.6 kbps enhanced half-rate vocoder
- System Vendors
  - Motorola
  - Harris
  - EADS
  - Power Trunk
  - Tait
  - Others

Questions?